APPENDIX A
Meeting Minutes and Response to Comments

APPENDIX A-1
Meeting Minutes

C-51 Rule Study

Meeting Summary

February 11, 2003 10:00 AM to 12:30 PM

To: Suelynn Dignard, Project Manager, SFWMD

From: Alan Hall, Project Manager, TBE

Subject: Structure Operations for C-51 Study

Attendees: Alan Hall, TBE
Bijay Panigrahi, BPC
Ken Konyha, SFWMD
Tony Waterhouse, SFWMD
Sharon Trost, SFWMD
Suelynn Dignard, SFWMD
Kathy Collins, SFWMD
Michael Voich, SFWMD
Ron Mierau, SFWMD
Andre Cadogan, JMJV
Chris Smith, COE (telephone)
Paul Moczynski, COE (telephone)
Jerry Grubb, COE (telephone)

The purpose of this meeting was to discuss the operational assumptions for both the primary (federal project) facilities and the key secondary (inflow) facilities. These assumptions will be used by TBE as we initiate operational testing of the hydraulic model for the Basin Rule study. TBE is currently constructing the hydrologic components using HEC-HMS.

I. Federal Facilities

The federal facilities consist of S-155, S-155A, S-319 and S-5AE.

A. S-155

The operations of this spillway, at the eastern end of C-51, which will be modeled is that the gates will be opened as needed to maintain an upstream optimum stage at the structure of 8.0 to 8.5. Once the capacity of the structure to accomplish this is exceeded then the gates will be fully opened (out of the

water) and the upstream stage will be allowed to rise based upon basin inflows.

B. S-155A

This structure is intended to function as a "divide" structure to prevent flows from the western basin from adversely affecting the eastern basin's flood control capacity. This structure will normally be closed with an expected tailwater level of 8.5. (It was stated that this structure will probably be closed "99% of the time.") This structure will be operated such that the headwater will be maintained at an optimum level of 12.0 and the tailwater kept below 11.0. These two stages are important for operational decisions at S-319 and in relation to secondary inflows, as will be discussed later in this memo. The "design" headwater at S-155A is 13.0, which means that for the 10-year storm the operation of the federal facilities are tied to keeping the stage at or below this level.

C. S-319

This is the major flood control element for the western basin. It is a major pumping station with 5 pumping units: two-550 cfs pumps, and three-960 cfs pumps. The operational criteria for this facility is tied to the headwater stage at S-155A. When the headwater at S-155A exceeds 12.0, the pumps are turned on sequentially to return the stage to 12.0 (first one 550 cfs pump, then the second 550 cfs pump, then one 960 cfs pump, then two 960 cfs pumps and finally all three 960 cfs pumps.). In order to avoid cavitation at the pump station an additional cutoff elevation at the pump station intake point is 9.0. So, if the intake at S-319 falls to 9.0 or the headwater stage at S-155A falls to 12.0 then pumps will be shut down, most likely in the reverse order of the start up sequence.

D. S-5AE

This is on the western end of the C-51 canal and represents a divide structure between the C-51 and L-8 basins. There was much discussion about using this structure to provide relief to the L-8 basin in addition to the western C-51 basin. It was generally agreed that use of this structure for that purpose, after the storm peak has passed, would probably be acceptable. However, in order to remain somewhat true to the original design purposes for the federal facilities it was decided that for these model runs this structure will be closed and act as a boundary condition.

At this point the COE personnel signed off of the conference call and we discussed operational assumptions for the secondary inflow facilities.

II. Secondary Inflow Facilities

Specifically, the inflow facilities of Indian Trails Improvement District M-1 Acreage Area, the Palm Beach International Airport facilities and the Acme Improvement District facilities.

A. Indian Trail Improvement District M-1 Acreage Area

This area is basically designated as Sub-basin 15B in the new sub-basin boundary map. The discharges from this area will normally be pumped north and west to the ITID reservoir and the L-8 basin. However, there does exist two control structures between this area and the Village of Royal Palm Beach system, the 40th Street Structure and the Roach Structure, which can allow for significant discharge south into C-51 via the M-1 canal. There currently exists a MOU, Memorandum of Understanding, between the SFWMD and the ITID which allows for the use of these structures during "off peak" conditions. The key to this MOU is of course defining what "off peak" conditions are. After much discussion it was generally agreed that the "intent" of this MOU is met by defining "off peak" conditions as conditions when the tailwater stage at S-155A is below 11.0 and the headwater stage is less than the peak design headwater level of 13.0 ft for the post West C-51 Project conditions.

B. Palm Beach International Airport

The installed capacity of the discharge pumping stations for the PBIA is twice the permitted rate for the airport property. They were allowed to install redundant capacity as a public safety feature, but are not allowed to operate at the double rate. The cut-off criteria, by permit, for these pumps is a stage of 13.0 in C-51 adjacent to the airport. For modeling purposes we will assume this to mean the stage in C-51 at the inflow location of the airport's southern pump station. It is not expected that this cut-off level will be reached for the 10-year event but may be reached for the 100-year analysis.

C. Acme Improvement District

The Acme ID Basin A has gravity discharge capabilities adjacent to their permitted pumping stations, Pump Stations Numbers 3, 4 and 6. For modeling purposes it will be assumed that all inflow to C-51 will be via these pump stations.

Acme Basin B will be assumed to not contribute to the C-51 during these initial model runs. Several alternative scenarios are currently being considered in support of the CERP program which may include either additional pumping facilities "attached" to Basin A's pump stations or a separate pumping station for discharge from Basin B either into C-51 or directly into STA-1E. The

specifics of these additional options will be worked out over the next 60 days by the SFWMD CERP team.

III. Summary

The initial model runs will be somewhat of a “free-flow” analysis to see what happens with the new federal elements in place and the only inflow restrictions being the physical capabilities of the inflow connections. After these initial model runs TBE will sit down with SFWMD staff to discuss inflow limitation options such as restricting inflows from a sub-basin to its permitted regulatory rate, if it exceeds that, or increasing it to the COE design rate, if it falls short (such as the 3 inches per day design assumption by the COE for the Loxahatchee Groves area).

C-51 Rule Study

Meeting Summary

March 14, 2003 11:00 AM to 1:00 PM

To: Suelynn Dignard, Project Manager, SFWMD

From: Alan Hall, Project Manager, TBE

Subject: Review of HEC-HMS Hydrologic Assumptions

Attendees: Alan Hall, TBE
Bijay Panigrahi, BPC
Ken Konyha, SFWMD
Tony Waterhouse, SFWMD
Suelynn Dignard, SFWMD
Andre Cadogan, JMJV
Mark Wilsnack, SFWMD
Jay Foy, ITID
Patrick Martin, LWDD
Clete Saunier, LGWCD
Tom Conboy, SFWMD
Alan Wertepny, Mock-Roos
Ken Todd, PBC

The purpose of this meeting was to discuss the hydrologic data and assumptions which have been developed by TBE for the HEC-HMS runoff estimation program.

TBE presented data and parameters for review and discussion as follows:

1. Rainfall

   A review of the design rainfalls used in previous studies as compared to the data extracted from the current Volume IV of the SFWMD Permit Information Manual.

   1984 SFWMD Study:
   10-year, 1-day = 8.5 inches
   10-year, 3-day = 11.55 inches
   100-year, 1-day = 13.5 inches
   100-year, 3-day = 18.35 inches

FEMA Study:

100-year, 1-day = 12.0 inches
100-year, 3-day = 13.1 inches

SFWMD Permit Manual Volume IV:

100-year, 1-day = 12.0 inches
100-year, 3-day = 16.3 inches (1.359 times 1-day value)
10-year, 1-day = 7.4 inches
10-year, 3-day = 10.0 inches

There was some discussion on whether to utilize separate design rainfall values for the eastern and western basins, with the general divide at SR-7. Since one of the study objectives is to evaluate overall C-51 system performance during major storm events, and to provide compatibility with previous studies, it was felt that a reasonable and prudent approach would be to use a single basin-average precipitation amount, as applied in the FEMA study and the 1984 study, for design analyses.

After a detailed review of the available rainfall data it was recommended that we use the SFWMD's Permit Manual Volume IV value for the 100-year, 1-day rainfall (12.0 inches) and adjust it with the 3-day factor of 1.359. This will provide the most credibility for the County when they approach FEMA with our modeling results in order to adjust the FIRM for the C-51 basin. When we reviewed the 1991 update to the rainfall maps (DRE-291) completed by Paul Trimble, with SFWMD, it also showed that a 100-year, 1-day value of 12.0 inches would be an appropriate value. Since FEMA did not evaluate the 10-year event it was decided to use the Permit Manual Volume IV value of 10.0 inches for the 10-year, 3-day rainfall (equivalent 1-day value of 7.4 inches).

C-51 Rule Reevaluation Study (Recommended Rainfalls):

10-year, 1-day = 7.4 inches
10-year, 3-day = 10.0 inches
100-year, 1-day = 12.0 inches
100-year, 3-day = 16.3 inches

2. Runoff Curve Numbers

TBE presented tables and graphics of the 42 sub-basin curve numbers based upon a GIS evaluation routine utilizing land use and soils data. There were some questions related the computed values, for example the value for sub-basin 11, Loxahatchee Groves WCD, was computed to be 81 versus a value of 79 which was previously computed by Crossroads Engineering. TBE explained that additional lands shown within the sub-basin, such as SR-80 and boundary set to middle of C-51 canal, would make this slight difference.

Jay Foy questioned the value for ITID's Sub-basin 15B and felt that the curve number should be much lower that the value of 85 shown. (It should be noted that after a detailed review of the site-specific soils and the average residential lot sizes TBE determined that a value closer to 70 would be more representative. The actual value will be re-computed before inputting into the Hydrologic Model.)

Some sub-basins had unusually large curve numbers such as the Strazulla property which computed at 96. It was decided that considering the soils and existing and projected land use as a restored wetland a high value for the curve number is appropriate.

Everyone in attendance was asked to review the data for their areas and provide feedback to TBE or Suelynn ASAP so we can stay on schedule with the model construction process.

3. Sub-basin Boundaries and Discharge points

TBE presented the node and reach diagram utilized by HEC-HMS for representing the hydrology of the basin. Each sub-basin was discussed and input and concurrence was requested for runoff characterization purposes. Some adjustments were made at this meeting to Sub-basins 20A and 20B to recognize their points of discharge into C-51, Sub-basin 20A west of S-155A and 20B east.

There was some discussion about the size and extent of Sub-basin 15B, ITID M-1 Acreage area. Jay Foy suggested that the entire 28+ square miles of ITID M-1 areas, both the Upper and Lower Basins, be included in this modeling effort. TBE explained that using properties historically, and normally, within the L-8 Basin was not the direction which we had received from the SFWMD. It was stated by TBE that realistically the 13+ square miles shown as Sub-basin 15B could be expected to contribute, under reasonable assumptions, during parts of the 10-year and 100-year storms. It was not reasonable to expect that the entire 28+ square miles, including the L-8 basin, would be either physically or politically (by permit and rule) able to contribute significant flows to C-51 during major storm events. This study does not include post storm drawdown analyses.

4. Memo from Operations Meeting of February 11, 2003

The final memorandum summarizing the interagency meeting was distributed to the External Review Team. This meeting (02/11/2003) was held with the operational staff of both the SFWMD and the ACOE. The operational performance criteria and assumptions described in the memo will be used in the hydraulic model.

The meeting finished with a request by TBE that all participants give their detailed review comments back within a week so that we may continue to stay on schedule. A subsequent meeting was scheduled with SFWMD operations

managers for March 26th and the next External Review Team meeting would be held on April 17th when we would review most of the assumptions and input data for the hydraulic model, HEC-RAS.

C-51 Rule Study

Meeting Summary

April 17, 2003 1:00 PM to 4:30 PM

To: Suelynn Dignard, Project Manager, SFWMD

From: Alan Hall, Project Manager, TBE

Subject: Review of HEC-RAS Hydraulic Assumptions

Attendees: Alan Hall, TBE
Bijay Panigrahi, BPC
Ken Konyha, SFWMD
Tony Waterhouse, SFWMD
Suelynn Dignard, SFWMD
Andre Cadogan, JMJV
Mark Wilsnack, SFWMD
Jay Foy, ITID
Patrick Martin, LWDD
Clete Saunier, LGWCD
Tom Conboy, SFWMD
Alan Wertepny, Mock-Roos
Ken Todd, PBC
Ron Mierau
Tommy Strowd
Arlan Pankow
Cal Neidrauer
Mike Voich
Bob Howard

The purpose of this meeting was to discuss the hydraulic data and assumptions which have been developed by TBE for the HEC-RAS hydraulic profile simulation program. TBE/BPC passed out maps of the sub-basins and a three-page 11X17 table of all of the secondary inflow facilities and operating assumptions. This table will be updated based upon input received during the meeting and be included in Technical Memorandum #2 for review.

TBE presented data and parameters for review and discussion. In order to accommodate attendees schedules we discussed sub-basin data for Lake Worth Drainage District first. Pat Martin, with confirmation from other attendees, stated that he now felt that the boundaries for Sub-basins 16A and 17 need to be adjusted to include additional lands

west of State Road 7 and north of State Road 80. Mr. Martin agreed to provide the canal cross-section data for the LWDD canals which control inflows from the following sub-basins:

Sub-Basin	LWDD Canals
17	E-1
18	E-2
23	E-3
20A	S-4
20B	E-1 and CS#2
21B	Homeland Canal, E-1
30	L-5
31	L-6, L-7
32	L-8, L-9
33	L-10, L-11

In addition to the above cross-section data, LWDD will provide control water levels and storm event-based operating criteria for their key control structures. (Note: a follow-up meeting was scheduled for Monday, April 21st at LWDD headquarters to collect this data.)

There was some discussion relative to the data requested as applying to existing conditions, for model calibration purposes, and proposed data for future, with federal project (S-319 and STA-1E), conditions. For example, Sub-basin 2A will be STA-1E in the future, but for purposes of model calibration with historic flows, it was previously 3 separate farming operations: citrus, sugarcane and sod. Also, the manner in which the two models handled the stage-storage assumptions was discussed. BPC explained that the stage-storage was handled within the hydrologic model, HEC-HMS, whereas the physical flow conditions and hydraulic limitations were handled by the hydraulic model, HEC-RAS. Several attendees commented that this would require some iterative processing of the data between the models and could be somewhat time-consuming. Dr. Panigrahi said that he understood this but these represented the best tools currently available for this type of H&H study. (Note: subsequent to this meeting, Dr. Panigrahi and Alan Hall met with Steve Lin, SFWMD modeler who had performed the 1984 study, and he indicated that that is exactly what was required in the previous work. As part of this contract is looking for results that are compatible with the 1984 study, then using the successor models appears to be the best solution.)

Next the remaining sub-basins were reviewed in sequential order for comments from the External Technical Review Team members:

Sub-basin 1 – It was noted that this land is currently permitted to Palm Beach Aggregates. Tony Waterhouse agreed to get the appropriate data from the permit files for TBE.

Sub-basin 2A – This was previously 3 separate farming operations and is now being converted into Stormwater Treatment Area 1-East. It was stated that for the purposes of this study the long-term water quality treatment performance of this STA-1E will not be a factor in the storm event modeling assumptions. For example, we will not limit inflows from either Acme Basin B or ITID M-1 Acreage Area based on water quality factors.

Sub-basin 2B – This area consists of about 1200 acres of rural residential and undeveloped lands. The five-acre lot sub-division known as Rustic ranches makes up about half of the area with vacant land under SFWMD ownership making up the rest. This area will be served by a seepage pumping system that is being constructed as part of the STA.

Sub-basins 3, 4, 5 and 6- These sub-basins were generally accepted by the group as presented in the table.

Sub-basin 7 – this was identified as the M-2 Acreage Area. There was discussion about the best way to handle the internal facilities of this sub-basin. For example the portion easterly of the M-2 Canal is sub-divided into 6 individual basins of about 200 acres each with individual culvert controls to limit flows into the M-2 Canal. Most of the rest of this sub-basin is drained by two gravity outfall structures and an internal pump station and 120-acre reservoir. It was discussed whether to break down individual sub-basins to this level of detail or not and agreed that such detail was beyond the scope and funding levels of this study. The original intent and scope of this work is to develop regulatory standards comparable to the original Basin Rule criteria.

Sub-basin 8 – This is known as the Seminole Water Control District or Callery-Judge Groves area. Discharges are controlled by a structure at the north end of the M-2 Canal from this sub-basin and from the overall combined facilities of Sub-basins 7 and 8 by a structure at the south end of the M-2 Canal.

Sub-basins 9 and 10 – These sub-basins were generally accepted by the group as presented in the table.

Sub-basin 11 – This is the Loxahatchee Groves Water Control District. It is currently served by 3 water control structures. The operating criteria and assumptions were modified and adjusted in the table as directed by Mr. Clete Saunier, LGWCD.

Sub-basin 12 – This is the Palms West Hospital site. Its boundaries will be adjusted to approximate the 74.1 acre site as listed in the permit files.

Sub-basin 13 – This is the Acme Basin A area with 3 pumping stations. The sizes and operating criteria was agreed as listed in the table.

Sub-basin 14 – This is Acme Basin B and will be modeled as described in a contract amendment previously distributed to the group.

Sub-basin 15A – This is the Village of Royal Palm Beach which is generally controlled by ITID water control facilities. The main outfall is via an Amil Gate structure with one side further limited via 4 slide gates. Water level control is by means of a culvert structure under SR-80 which is filled in half-way to hold water levels at approximately 13.5. The Amil gate opens at 13.8 feet. The 4 operable slide gates are 6.08', 5.82', 5.74' and 5.96' wide and open from the bottom with a sill elevation of 2.7'. These slide gates are used to balance the flows from Sub-basin 15B such that the stages in Sub-basin 15A are not adversely affected.

Sub-basin 15B – This is the M-1 Acreage area and has outflows controlled via two structures: the Roach Structure and the 40th Street Structure. The Roach Structure is twin 84" X 80' RCP culverts with inverts at 7.0' and upstream slide gates. The 40th Street Structure is a 60" X 76' RCP culvert at invert 8.0' with upstream operable gates. Due to the limited capacity of the culvert, the upstream gates are not identified as the controlling hydraulic features.

Sub-basin 16A – This is formerly facilities of the Northern Palm Beach County Improvement District which are now permitted to the Village of Royal Palm Beach. Facilities were accepted as described in the table. This area will be reduced in size based upon the input received during this meeting from Patrick Martin of LWDD.

Sub-basin 16B – This is the area north of Okeechobee Boulevard that drains into Sub-basin 16A via a long, hydraulically restrictive, culvert and is maintained by the County as a preserve area.

(Sub-basins 17, 18, 20A, 20B and 21B covered earlier with LWDD)

Sub-basin 21A – This is the Strazulla property which has outflow only after filling up and spilling over into the Heritage Canal.

Sub-basin 22, 23, and 24 are all LWDD facilities which are controlled as described in the table.

Sub-basin 25A and 25B – These areas are controlled by a structure at the south end at the southwest corner of the airport property. This structure was delineated in the table.

Sub-basins 26, 27 and 28 – These are portions of the airport and controlled by facilities as described in the table.

Sub-basin 29A – It was decided at this meeting that, due to the multiple structures and operating conditions, this area should be divided into two connected sub-basins, so a new Sub-basin 29B was identified with outfall controlled by the Okeechobee-Australian Avenue structure. The balance of the area was controlled by a structure on the eastern Stub Canal leg which is operated by the City of West Palm Beach as part of the Renaissance Project. Alan Wertepny, Mock-Roos, agreed to provide TBE with the hydraulic data on these two structures.

(Sub-basins 30, 31, 32 and 33 was covered earlier)

Sub-basin 34 – This are facilities of the City of Lake Worth which discharge directly into C-51 upstream of S-155 via a storm sewer network.

Sub-basin 35 – This is the Town of Cloud Lake. It discharges via a 12,000 GPM pump into the southern reaches of the Stub Canal.

Sub-basins 36 and 37 – These are part of the City of West Palm Beach system. Alan Wertepny, Mock-Roos agreed to provide to TBE the data on these outfalls.

Sub-basin 38 – This is the Vista Centre project. It is controlled by a weir structure that Alan Wertepny agreed to provide the data for.

There was some discussion at the end of the meeting concerning the validity of the LIDAR data and how it is applied within the H&H modeling. It was pointed out that the COE data set, which constitutes more than 80% of the basin, has been field verified and checked by the COE and we feel that it represents the best available information for this watershed. The balance of the data set was provided by Palm Beach County and and adjusted to be compatible with the COE data. It was discussed that presentation of the stage-storage information graphically in Tech Memo #2 will provide some visual confirmation and aid in the comfort levels of reviewers as we move forward with this study.

At the end of this meeting all were asked to further review the hydraulic data table for accuracy and assumptions and to respond ASAP to Suelynn or TBE. Also, follow-up meetings were set with LWDD and Steve Lin, 1984 modeler, for further data refinement and confirmation.

APPENDIX A-2
Response to Comments

C-51 Basin Rule Reevaluation Contract (C-13412)

Comments on Draft Deliverable #2

Overall, TBE Group Inc. has done a great job of preparing Technical Memorandum Number 2 for the C-51 Basin Rule Reevaluation Contract. The comments listed below are compiled based on review of the draft deliverable by the internal SFWMD Team (Part A) and the external Technical Review Team (Part B) for the C-51 study.

Part A: SFWMD Internal Review Team Comments

The following comments on draft Deliverable #2 are provided by SFWMD's Internal Review Team for the C-51 study.

Comment A-1: Section 1.2, Page 1, Last Paragraph, Second Sentence:

- Believe a word is missing: "...along **the** C-51 canal."

Response: *Revised*

Comment A-2: Section 1.2, Page 2, Task 2, Last Line:

- Believe a word is missing: "...performance of **the** C-51 canal system".

Response: *Revised*

Comment A-3: Section 1.3, Page 4, Last two Paragraphs, Scope for Task 2&3:

- Include the contract amendment scope activities for each task
- Add more detail on how Task 3 will be carried out.

Response: *Revised*

Comment A-4: Section 1.4, Page 4, Second Paragraph:

- Only the June event is referenced for calibration. Why is the October event not referenced here?

Response: *Revised*

Comment A-5: Section 2.1, Page 6, Third Paragraph:

- Third Sentence: "Section 2.2 presents a complete **description of** …" would be better wording than "… detail on …"
- Second last sentence: "in to" should be "into".

Response: *Revised*

Comment A-6: Section 2.2, Page 6, First Paragraph, Third Sentence:

- Believe a word is missing: "… features include **the** C-51 canal…".

Response: *Revised*

Comment A-7: Table 2-1, Sub-Basin 1, under Locality:

- "Pal Beach Aggregate" should be "Palm Beach Aggregate"

Response: *Revised*

Comment A-8: Section 2.3, Page 12, Last Sentence:

- Land use distribution is provided in Appendix **B** not A.

Response: *Revised*

Comment A-9: Section 3.1, Page 21, Last Sentence of Section:

- I understand RAS was upgraded to Version 3.1.1. Please ensure correct version is stated.
- At beginning of study, it was indicated that the GeoRAS would be used. Is GeoRAS and/or GeoHMS being used? If so modify wording appropriately.

Response: *Revised and explained*

Comment A-10: Section 3.2, Page 21, Basin Area and Land Use:

- Were there any changes made to the DTM since the December submittal? If so please provide updated version.
- Provide the revised basin/sub-basin GIS coverage/shape file electronically.

Response: *No; Not Applicable*

Comment A-11: Section 3.2, Page 22, Curve Number:

- Last Sentence: Reword to reflect that the table shows calibrated CN's: "Table 3-1 summarizes the **calibrated** CN for each sub-basin." Instead of "computed".
- Table 3-1: Rename column "Weighted Curve Number (CN)" to just "Curve Number (CN)" or "Calibrated Curve Number (CN)" as the table shows the calibrated not the computed weighted CN.

Response: *Revised and explained*

Comment A-12: Section 3.2, Page 23, Time of Concentration and Time Lag:

- Fourth Sentence: Reword to reflect that the table shows calibrated CN's: "The **calibrated** values of the time of concentration for the sub-basins are summarized in Table 3-1".

Response: *Revised and explained*

Comment A-13: Section 3.4, Page 24, Fourth Sentence:

- Believe a word is missing: "In addition, **the** HMS/RAS model…"

Response: *Revised*

Comment A-14: Section 3.5.1 and Table 3-3 and Table 3-4:

- Second Paragraph: You state that the 10-year and 100-year storm event rainfall quantities generated during the FEMA study were not significantly different from the published values of 1990. However, Table 3-3 only shows FEMA rainfall values for the 100-year event, and not the 10-year event. Please revise as appropriate.

- Paragraph following Table 3-3: You recommend to continue to use SFWMD rainfall frequency curves of 1990 and that based on this publication Table 3-4 presents estimated rainfall quantities. Table 3-4 shows a 1-day, 100-yr rainfall of 12, and Table 3-3 shows the same rainfall event as 11.4. Please describe in more detail how the value of 11.4 was obtained from Paul Trimble's Rainfall 1990 frequency publication for Table 3-3. From Trimble's document alone, which is the same as Volume IV of the permit manual, 12 could be selected over any other number based on interpolation from the rainfall contours. Believe Table 3-3 should be revised to show 12 as the 100-year, 24 hour rainfall.
- Associated Meeting Minutes, March 14, 2003, Appendix A: Comments received and provided to you via e-mail on the meeting minutes were not incorporated into the revised minutes. With respect to the comments on Rainfall, you have incorporated the comments into the TM documentation (Section 3.5.1), but not into the Meeting Minutes. For consistency, please revise the minutes as well, including the correction to the above noted inconsistencies.
- Paragraph following Table 3-3: Identify that this study uses a single rainfall over the entire C-51 basin.
- Paragraph following Table 3-4, First sentence: Change "would be" to "**will be**".

Response: *Revised*

Comment A-15: Figure 4-1, Nodal Diagram:

- Please confirm if sub-basins 20B, 21A and 21B are all discharging to eastern C-51 through the E1 canal. (This appears to be true from Table 2-2. Please confirm this is represented in the Nodal Diagram.)

Response: *Revised, please refer to the new nodal diagram (Figure 3-2)*

Comment A-16: Section 4.2, Page 31, Curve Numbers:

- Discuss the methodology and reasoning for modifying the CNs during calibration. For instance, how were the modifications determined for each sub-basin? Based on the table in Appendix B, the CNs in the eastern sub-basins were generally reduced by about 14.5% (14.2-14.8 %), with sub-basin 21B reduced by 18.3 %. However, the CNs in the western basins were reduced by a much larger range of 23-34 % - why such a range between the western sub-basins? Discussion on how the calibration was carried out may help to answer this question.
- During the calibration process, did you look at the actual conditions leading up to observed events used in the calibration? You identified 1999 as the wettest year between 1996 and 2000, but were conditions dry in the days/weeks leading up to the events? The differences between computed and calibrated could be related to antecedent moisture conditions. If observed conditions were dry prior to the storm, the computed CN values may be more appropriate to use in the design simulations as we cannot predict the antecedent conditions during design and the wet condition should be used.

However, if the actual conditions were wet during the observed event used for calibration, the calibrated CN numbers may more accurately reflect actual conditions.... This is just an example. Include documentation to provide discussion on the logic and reasoning as well as the resulting recommendations for use in the application phase of the design events during Task 3.

- Following the March 14 meeting and comments from Jay Foy regarding the CNs, particularly for sub-basin 15B, you indicated that re-calculation of the CN values for some sub-basins - mostly those similar to sub-basin 15B, would be required. In the Meeting Summary for the March 14 meeting you indicated that "after a detailed review of the site-specific soils and the average residential lot sizes TBE determined that a value closer to 70 would be more representative (than the 85 originally presented for sub-basin 15B)." However, the calculated composite CN shown for sub-basin 15B in Appendix B is still 85.8. Does the table in Appendix B not reflect the revised calculations? Please explain, and if necessary correct the table.

Response: *Revised, please refer to the newly organized Sections 3.3 and 4.3*

Comment A-17: Section 4.2, Page 31, Time Lag:

- You indicate that the Time Lag values were adjusted during calibration and that it is the calibrated Time Lag shown in Table 3-1. The **calculated** Time Lag and Time of Conc. shown in Appendix B are identical to those shown as **calibrated** in Table 3-1. It is stated in Section 4.2 that the calibrated values did not deviate significantly from the calculated values. This suggests some change, all be it small. Please explain why the values shown are identical, or if a column was copied incorrectly please revise to accurately reflect correct values.

Response: *Revised, please refer to the newly organized Sections 3.3 and 4.3*

Comment A-18: Section 4.2, Page 31, Control Structures and Rating Curves:

- Under Rating Curve Development Section 3.4, you state that the rating curves were developed using an assumed tailwater condition. Further reading in Section 4.2 indicates that you will have to verify the assumption of the tailwater level being lower than the control elevation of the particular structure allowing free flow conditions. This is an iterative process and it should be referenced in Section 3.4 that such assumptions have to be verified. Last sentence of Section 4.2 states “The rating curves may be modified based on the downstream stage, if necessary”. It should be clearly identified if this verification was completed and what, if any, modifications were made.

Response: *Revised, please refer to the newly organized Sections 3.6 and 3.7. The rating curves are no longer manually generated, they are automatically generated by HEC-RAS*

Comment A-19: Section 4.2, Page 32, Under Calibration Location:

- Capitalize beginning of second last sentence "**T**he...".

Response: *Revised, please refer to the newly organized Sections 3.6 and 3.7*

Comment A-20: Section 4.3, Page 32, Under Calibration results, last sentence:

- Replace "peal discharge" with "**peak** discharge".

Response: *Revised and reorganized*

Comment A-21: Section 4.3, Page 32, Results:

- The results of the calibration and sensitivity are presented, but there is no discussion of these results. A summary should be provided and at a minimum should include what the calibration and sensitivity results mean to the application phase and why.

Response: *Not Applicable*

Comment A-22: Section 5.1, Last Paragraph:

- Second Last Sentence: Change "would be" to "**will be**"
- Last sentence is awkward / ambiguous.

Response: *Revised and reorganized*

Comment A-23: Section 5.2, Page 38, Channel Cross-Sections and Levees:

- Identify that cross-sections were "believed" to have been field surveyed. Please verify.
- Replace the "-" number of section in the C-51 west and east with the correct numbers.

Response: *Revised and reorganized*

Comment A-24: Section 5.2, Page 38, Manning's n Coefficients:

- This is a key input parameter. Sensitivity results on this (as well as other) model input parameter(s) should be shown and discussed.
- Provide description on the assumptions used to assign the Manning's n values and how the ranges were applied.

Response: *Revised and reorganized*

Comment A-25: Section 5.2, Page 38, Bridges:

- Fourth Sentence: Spelling error "For the **sake** of simplicity…"

Response: *Revised and reorganized*

Comment A-26: Section 5.2, Page 40, Initial Conditions:

- Second Sentence: "searched in DBHYDRO" could be better phrased.
- What will be the initial conditions in Task 3?

Response: *Not Applicable for this Task*

Comment A-27: Section 5.2, Page 40, Boundary Conditions:

- First sentence: Remove "the" from "The river station 0+00 is ~~**the**~~ considered the …" **Response:** *Revised*
- What will be the boundary conditions in Task 3?

Response: *Not Applicable for this Task*

Response: *Revised and reorganized*

Comment A-28: Section 5.2, Page 40, Inflow Hydrographs:

- First sentence, third last word: Replace "basin" with "**sub-basin**".
- Second sentence: Believe a word (the) is missing, and a word should be deleted (basin): "As described in Section 4, **the** HMS model generated the ~~**basin**~~ outflow hydrographs…"
- Sixth Sentence: Believe a word is missing: "… at certain location where tributaries meet **the** C-51 canal."
- Last Sentence: "**provided**" would be a better word than "given".

Response: *Revised and reorganized*

Comment A-29: Section 5.2, Page 40, Calibration Locations:

- Paragraph is awkward and not clear. What is being said here?

Response: *Revised and reorganized*

Comment A-30: Section 5.3, Page 41, First Paragraph:

- Last sentence: States that the model output, including the inflow hydrographs, is provided in electronic format in Appendix C. **No** electronic version is included in Appendix C in the document. Add the CD to Appendix C as identified in the report.

Response: *Revised and reorganized*

Comment A-31: Section 5.3, Page 41, Second Paragraph:

- First sentence following Table 5-1: "some other" is ambiguous.
- Last two sentences: Explain in more detail.

Response: *Revised and reorganized*

Comment A-32: Section 5.3, Page 42, Last Paragraph:

- The final report should reflect the discussion of the results that is referenced in this sentence.

Response: *Revised and reorganized*

Comment A-33: Data Presentation for QA/QC:

- The suggestion for presentation of the hydraulic and hydrologic data via canal profiles and the stage-storage graphics with corresponding structure control elevations, or something similar, was not incorporated into the report.

Response: *Revised and reorganized*

Comment A-34: Report Submittal:

- Include a CD of the entire report with each hard copy.

Response: *Not Applicable*

Comment A-35: Page 25:

- Why was a C value of 2.7 used for the weir flow. Some basins are sharp crested weirs, at least one is probably broad crested.

Response: *Revised and reorganized*

Comment A-36: Table 4-1:

- Not clear what Table 4-1 represents.

Response: *Revised and reorganized*

Comment A-37: Table 4-1, 4-2, 4-3:

- Are the values in Tables 4-1, 4-2, 4-3 at node S-155 supposed to present flow at the structure? If so, the values all seem way too high, i.e., range from 7300 up to 22,200 cfs.

Response: *Revised and reorganized*

Comment A-38: Pages 33-34:

- The computed difference values in the tables don't appear right. The difference between simulated and observed values at S-155 in Table 4-1 should be -35.8% and not +15.9%. Similar problem with Table 4-2.

Response: *Revised and reorganized*

Comment A-39: Figure 5-2:

- Not sure how to interpret Figure 5-2. What are the vertical lines extending up from the ground level? Why do left and right levee values stop east of SR7?

Response: *Revised and reorganized*

Comment A-40: Pages 41:

- Difference between simulated and observed values looks like it should be -40.8% and not +6.7%. Text below table would also have to change.

Response: *Revised and reorganized*

Comment A-41: Page 6:

- Explain why you did not include secondary and tertiary conveyance systems.

Response: *Revised. Limited to the scope of services*

Comment A-42: Page 27:

- Explain storm depth values in Table 3.4.

Response: *Revised and explained*

Comment A-43: Page 31, Curve Numbers Section:

- Define (quantify) "reasonable agreement between the simulated and observed peak flow".

Response: *Not Applicable*

Comment A-44: Page 31:

- Was sensitivity analysis performed on the initial abstraction value?

Response: *No*

Comment A-45: Page 33, Table 4-1:

- Explain if peak flow differences of 30% and 16% are acceptable. They seem high and indicate that the calibration process should continue.

Response: *Revised and reorganized*

Comment A-46: Page 41, Table 5-1:

- 71.4 and 78.6% difference? These are high values. During the calibration process, parameter values are adjusted in order to get model results closer to real observations. After this step, the model needs to be validated. During validation, the calibrated parameters are used and can not be changed or adjusted anymore. A new simulation is performed for a different period of time than the one used during calibration. The model output is compared to real observations. At this point, if you had performed a good calibration, model results should be close to real observations. It seems that the contractor did not validate the model. He presented the results for the calibration process only. It is not clear if this is something they will do.

Response: *Revised and reorganized; Not Applicable*

Comment A-47: Page 19:

- Kinematic wave and Muskingum-Cunge routing techniques should not be used where backwater effects are significant.
- How are backwater effects due to basin inundation taken into account when computing the runoff hydrographs?

Response: *Not Applicable*

Comment A-48: Page 24:

- How applicable is the relationship $T_l = 0.6T_c$ in the C-51 basin?
- How many iterations between the 2 models were required to account to tail water conditions at outflow points?
- Table 2-2 should read Table 3-2.

Response: *Not Applicable*

Comment A-49: Page 24:

- A straight application of Manning's equation may not yield an accurate rating curve for culverts. A backwater analysis or application of the FHWA approximate method is suggested.
- Single rating curves for channel outflows generally cannot be developed in the C-51 basin due to backwater effects. Backwater analyses should be used to compute a family of rating curves for varying tail water conditions.

Response: *Not Applicable*

Comment A-50: Page 27:

- Why were only 2 rainfall gages utilized in this study?

Response: *Not Applicable*

Comment A-51: Page 28:

- How were tail water effects accounted for in computed S-155 discharges?

Response: *Revised and reorganized*

Comment A-52: Page 29:

- It appears that the "sensitivity test" should be more accurately referred to as model validation.

Response: *Revised and reorganized*

Comment A-53: Page 31:

- Is it not possible for the western basin to receive more rainfall than the eastern basin for an arbitrary storm event?
- For the present version of the model, it is probably only meaningful to compare flow volumes.
- How many iterations between the 2 models were required to account to tail water conditions at outflow points?

Response: *Not Applicable*

Comment A-54: Page 32:

- The UNET model should be used to route flows in all major channels. Otherwise, comparisons between the various routing techniques should be made in order to evaluate the accuracy of the Muskingum-Cunge and Kinematic Wave routing techniques.

Response: *Revised and reorganized, Not Applicable*

Comment A-55: Page 33:

- Comparisons of flow volumes were not provided in table 4-1.
- The error of 15.9% does not appear to be correct.

Response: *Revised and reorganized*

Comment A-56: Page 34:

- Some of the percent error figures in tables 4-2 appear incorrect.

Response: *Revised and reorganized*

Comment A-57: Page 36:

- Why were breakpoint flow data at S-5AE not used to construct an upstream boundary hydrograph? Also, the measured tail water hydrograph based on breakpoint data could be used for calibration.
- The major secondary canals listed can be included in the UNET model by connecting them to C-51 through their respective structures.
- Does the USGS monitor any stages or flows within LWDD?
- Were any high water marks obtained in the basins during IRENE that may be useful for calibration?
- Does ACME have any record of its pumped discharges, if any, into C-51 during Irene?

Response: *Revised and reorganized, Not Applicable*

Comment A-58: Page 38:

- What was the source of the surveyed cross sections?
- Please explain the spikes shown in figure 5-2.
- The selected range of Manning's n may be too low if channel flows were impeded by hydrilla, clogged bridges, etc.
- The measured channel cross sections should be shown more clearly on a map.
- Was structure G-124 present in the C-51 channel during Irene?

Response: *Revised and reorganized, Not Applicable, Refer to TM #1 for data sources*

Comment A-59: Page 40:

- Why was S-155 not simulated in UNET as a SFWMD structure with vertical lift gates? **Response:** *Used with gate openings*
- The use of a constant initial flow for the entire C-51 channel is not recommended. **Response:** *Not Applicable*
- Why were tidal stages not used for a downstream boundary? **Response:** *Not Applicable*
- A flow hydrograph based on breakpoint data should be used as an upstream boundary. **Response:** *Disagree, Not Applicable*

Comment A-60: Page 41:

- It is likely that the calibration errors are partially due to the hydraulic model's lack of all of the major canals in the basin. It is not likely that the hydrologic model can be used to route flows accurately in the major channels.
- Please provide plots of the flow hydrographs at calibration locations.

Response: *See revised model results*

Comment A-61: Appendix B:

- The rating curves for outfall structures in basins 15B, 16A, 17, 21A, 21B, 25B, 28, 29A, 29B, 30, 31, 32, 33, 36, and 37 appear to reach constant flows above a specified elevation. These structures were indicated to consist of weirs, culverts, gates and open channels. Please clarify.

Response: *Revised and reorganized, Not Applicable*

Comment A-62: Appendix C:

- Why was an implicit weighting factor of 1.0 used? What was the effect of reducing this while increasing the time step?

Response: *Not Applicable*

Comment A-63: General Comment, Quality of Electronic Figures:

- The maps provided in electronic form are somewhat fuzzy and difficult to read.

Response: *Please zoom in for clarity*

Comment A-64: General Comment, Routing Technique:

- The Muskingum-Cunge and Kinematic Wave routing techniques are generally not accurate in the C-51 basin and should not be used. It was our previous understanding that the hydrologic model would be used to generate outflows

from each basin at the discharge point to any major channel. Thereafter, the hydraulic model would be used to route flows. The large secondary canals within the basin such as M1, M2, E1, E2, etc. should be included in the UNET model. Hydrologic routing techniques cannot be used in these channels due to backwater effects and flow reversals. Until these changes are made, it will be difficult to evaluate the calibration results.

Response: *Revised*

Comment A-65: General Comment, Quality of Electronic Figures:

- The methods documented in TR-55 for computing time of concentration may be highly inaccurate in the C-51 basin due to flat slopes and backwater effects. In particular, the computed values for t_c may be too small. The possible consequences of this should be addressed through sensitivity analysis.

Response: *Not Applicable*

Comment A-66: General Comment, Quality of Electronic Figures:

- The report in generally is written in a clear and concise style and does a good job at summarizing basin information.

Response: *Thank you*

Comment A-67: General Comment:

- A sensitivity analysis should be conducted to evaluate the effects of the various input parameters on computed stages and flows. In particular, a sensitivity analysis should be conducted on the hydraulic model to determine the most suitable combination of time step and implicit weighting factor. Also, how do the selected spatial and temporal discretizations compare to the Courant condition?

Response: *Revised and* reorganized, Not Applicable

Part B: External Technical Review Team Comments

The following comments are compiled based on review of the draft deliverable by the external Technical Review Team for the C-51 study.

Comment B-1: Page 8 – Table 2-1 – Summary of Basin Information on Sub-Basins 13, 14 (Acme Basin A and Acme Basin B):

- Reviewer identified: Please note that Basin B is approximately 8,610.1 acres as compared to the 9,270.3 acres reported in the Table. Currently the lands in Section 24, Range 41E, Township 44S, north of the Kahlert property (69.4 acres) are not currently discharging into Basin B. In the future it may discharge into Basin A. As long as this is recognized by the District that these lands in Section 24 may become a part of Basin A, there is no need at this time to modify the basin boundaries for Sub Basins 13 and

Response: *Not Applicable*

Comment B-2: Page 10 – Table 2-2 – Sub-Basin 16A Structure:

- Based on reviewer's records with Northern Palm Beach County Improvement District, the structure consists of 190 feet of triple 72 inch diameter RCPs with an upstream 30 foot wide weir at a crest elevation of 13.0 feet NGVD.

Response: *Modified in the model*

Comment B-3: Page 14 – Table 2-2 – Summary of Existing Land Use – Sub-Basins 13 & 14:

- Reviewer's information of Basin B indicates that the lake/waterway area is approximately 461.3 acres.

Response: *Not Applicable*

Comment B-4: Page 23 – Table 3-1 – Summary of Basin Parameters – Sub-Basin 38:

- The weighted curve number (78.4) appears to be high when compared to the other sub-basins.

Response: *Not Applicable*

Comment B-5: Page 41 – Table 5-1 – Summary of Calibrated Stages and Flows:

- The calibration of stage appears to be reasonable and the peak flow comparison for simulated and observed at S-155 appears to be reasonable. However, as noted in the text, the simulated flow is off more than seventy percent of the measured values and there is a time lag between simulated (13 hours earlier) and observed peak. Any thoughts on why the discrepancies? Could operation of discharge structures west of S. R. 7 (e.g., Indian Trail Improvement District, South Florida Water Management District….) during the October 1999 storm cause this? I recall that ITID stages were high for this event and releases were subject to stages in the C-51 canal east of Congress Avenue. Perhaps a discussion with Operation personnel may provide some insight.

Response: *Refer to revised model results in Section 4*

Comment B-6: Figure 1-1:

- The quality of Figure 1-1 on the CD is poor, I trust the report will be better. A site location map could be much simpler.

Response: *Zoom in to larger size for clarity*

Comment B-7: Figure 2-1:

- Most people do refer to ITID's major canal in the M-1 Basin as the "M-1" Canal. Actually, it is the "M-1" Canal in your basin 15A and the "B" Canal is your basin 15B.
- In addition, FYI, north of ITID's Pump Station #2, the "B" ("M-1") Canal is adjacent to the basin not in basin 15B.
- Another FYI, Seminole Pratt Whitney Road is not Seminole Boulevard.

Response: *Figures have been revised*

Comment B-8: Figure 5-2 and 5-3:

- It bothers the reviewer to have the graphs x-axes increase to the west. Reviewer would like to see these x-axes reversed.

Response: *Not Applicable*

Comment B-9: Figure 5-3:

- Reviewer suggests a horizontal grid to assist in reading the graph. Believe the purpose of this graph is to display water surface stages. As such, reviewer respectfully suggests a y-axis scale of 4(?) to 18. Reviewer does not understand why both the initial and final stages at S-155 are substantially below control for the entire reach of C-51 through to station 44,000.

Response: *Have been added*

Comment B-10: Table 2-1:

- Sub-Basin 15B, "comment column" should be M-1 Acreage Area Lower Basin. Also, Sub-Basin 7 add comment M-2 Basins.

Response: *Have been revised*

Comment B-11: Table 2-2:

- Sub-Basin 15A, B15A is a D-710 Amil Gate, not a D-170.
- Sub-Basin 15A, B15A: If the column "Conveyance System" is to relate where the discharge goes, the 2-72" RCP with concrete weirs discharge into C-51 not the M-1 Canal.

Response: *Have been revised*

Comment B-12: Table 3-1:

- Now reviewer is concerned that the CN values are too low. The cited values may be correct for average annual conditions, but reviewer believes are too low for the wet season, especially in August, September and October when we can expect a major rainfall. The CN's are one of the most, if not the most, important input in this modeling approach. A single event analysis must get starting conditions that represent a reasonable wet season expectation. This would not be a concern for a "period of record" analysis, which would allow for antecedent rainfall conditions. Also, fortunately or unfortunately, our canal systems convey water much quicker than conventional Stormwater collection systems. As such, the time lags may be too long.

Response: *Refer to revised model results in Section 4*

Comment B-13: Page 31, Curve Number:

- Soil storage changes with varying antecedent moisture conditions. Soil storage is slow to bleed down. Reviewer believes the reason lowering curve numbers helped calibrate the model is in the inherent limitations of conveyances within sub-basins. That is, this level of modeling assumes all runoff is directly connected to the outfall control structure. In actuality, many pockets of surface storage exist which delay or cut off this hydraulic

connection. Without doing it myself, reviewer does not know what other variables could be used to "calibrate" the model. Reviewer understands this approach may work to calibrate the model and now understand why the CN's in table 3-1 are low. At the same time, it should be acknowledged that these CN's are inconsistent with what the SFWMD allows in their regulatory function. The SFWMD may be put on the defensive with the publication of these CN's. Reviewer believes this calibration also points out the net disadvantage of a single event analysis.

Response: *See response to Comment B-12*

Comment B-14: Table 5-1:

- Table 5-1 cites an observed flow of 22,200 cfs at S-155. This is in conflict with what SFWMD operations is writing to FEMA and I believe way too high.

Response: *Refer to revised model results in Section 4*

Comment B-15: Section 1.4, Level of Service:

- The report says the largest amount of rainfall for both the 24 and 72 hour storm in 1999 was recorded on June 7-9, 1999. Reviewer thought that ITID recorded higher numbers than that for Hurricane Irene. Could we check on that? Also, the Hurricane Irene After Action Assessment report put out by the District shows two locations that are higher than that. Also, Section 3.5.2 of this draft report says that Irene produced higher rainfall.

Response: *Section 1.4 has been revised to reflect the correct information*

Comment B-16: Section 3.4, Rating Curve Development:

- Are all the weirs using a coefficient of 2.7 or just the District structures?
- Are all the friction coefficients for CMP using a "N" value of .022?

Response: *No routing curve is developed manually. Weir coefficients are different based on District and other structures and weir types. See the RAS model results.*

Comment B-17: Section 3.5.2, Rainfall Event:

- The rainfall amounts mentioned for Hurricane Irene (Oct. 14-16) seem low (see previous comment).

Response: *Section 3.5.2 has been revised to reflect the correct information*

Comment B-18: Section 4.2, Model Components:

- The report says 7.81 inches were applied to all sub-basins west of SR 7. As previously mentioned, I believe ITID had higher rainfall totals for that 3 day period. They should be consulted to verify.

Response: *See response to Comment B-17*

Comment B-19: Table 4-1 (and others):

- This table, as well as several others, reports an observed flow of 22,000 cfs at the S-155 structure. This number seems very high to me based on discussions

several of us have had with Tommy Strowd of Operations concerning flows over that structure during Hurricane Irene. In fact, Tommy sent a letter to FEMA that discusses having a maximum flow of approximately 7,000 cfs through the S-155 structure. The values in the tables should be discussed further with Operations. Also, since the structure is only rated for 4500 cfs, a flow of 22,000 cfs seems too high.

Response: *See response to Comment B-14*

Comment B-20: General:

- Finally, Reviewer agrees with some of the other comments submitted discussing appropriateness of the curve numbers used. Can the Technical Review Committee discuss this more in detail?

Response: *Not Applicable*

C-51 Basin Rule Reevaluation Contract (C-13412)

Comments on Revised Draft Deliverable #2

Overall, TBE Group Inc. has done a great job of preparing the revised draft Technical Memorandum Number 2 for the C-51 Basin Rule Reevaluation Contract. The comments listed below are compiled based on review of the revised draft deliverable by the internal SFWMD Team (Part A) and the external Technical Review Team (Part B) for the C-51 study.

Part A: SFWMD Internal Review Team Comments

The following comments on draft Deliverable #2 are provided by SFWMD's Internal Review Team for the C-51 study.

Comment A-1: Figure 1-1:

- Poor Quality. Response to the July 14, 2003 Comment A-63 and B-6 of "Zoom in to larger size for clarity" results in less clarity for this figure.

Response: A revised version of the figure was provided

Comment A-2: Section 1.5, Page 5, First Paragraph:

- Add Clete J. Saunier, Loxahatchee Groves Water Control District to the list of contacts for useful information.

Response: Updated

Comment A-3: Table 2-1:

- Table is split over two pages. From looking at the content it can be concluded that the first page of the table is for the C-51 East Basin and the second page is for the C-51 West Basin. Please note appropriately in the title on each page of the table.

Response: Table 2-1 is renumbered and updated accordingly

Comment A-4: Section 3.5.2, Page 28:

- First Paragraph, Second Last Sentence: The storm events occurred "**from** 14th through 16th October…" not "in 14th through 16th October…"
- Second Paragraph, First Sentence: "The 72-hour storm event **from** 14th through 16th October corresponds to ~~**the**~~ Hurricane Irene that struck…"
- What is the June event used for? Why are the validation results of applying the June event to the calibrated model as in the initial draft not shown?

Response: Revised and updated. June event is presented for informational purpose. The validation results of June event is not necessary since the calibration period has been extended from 2 days prior to 2 days after the calibration storm event.

Comment A-5: Section 4.5, Page 39, Last Paragraph and Table 4-2:

- Please clarify correct value of Peak Flow at S-155. Text indicates 7871 cfs, Table indicates 7805 cfs, and data indicates 7821 cfs. Please check and revise appropriately.

Response: Please see the text. For comparison of measured vs. simulated please refer to hourly measurements presented in Appendix B.

Comment A-6: Section 4.5, Tables 4-1 and 4-2:

- C-51 canal losses may be underestimated. Results showing the simulated lower stage at S155 could be in part due to the simulated flows being higher than observed/designed? Structure is designed for a max discharge of 8000 cfs. Simulation shows 9298 cfs through this structure. Observed data shows 7821 cfs.

Response: Revised and updated

Comment A-7: Figure 4-1:

- Legend / title is not clear. Simulated stages? Please clarify the legend, explain the EG vs WS, the "Crit…" items.
- Figure (or an additional figure) should show observed stages superimposed on the simulated for graphical comparison - where available.

Response: Revised and updated. A new figure has been added.

Comment A-8: Figure 4-2:

- Same as above comment A-7 - Title should be clear to indicate these are simulated stages and flows. This figure (or an additional figure) should show observed stages superimposed on the simulated for graphical comparison - where available.

Response: See Response to A-7

Comment A-9: Section 4.5, Page 43, First Paragraph:

- "The calibration locations are identified on the Figure." These are not clearly indicated on the figure. Clarifying the legend for this figure (4-1) should help.
- The outputs, inflow hydrographs, and model result summaries indicated as being provided in Appendix C were not there.
- Similarly, Response to July 14 Comment B-16 indicates to see the RAS model results, which are supposedly in Appendix C. As identified in previous bullet, Appendix C is empty.

Response: Refer to Appendix C-1 for HMS results, Appendix C-2 for RAS results, and Appendix C-3 for electronic model data.

Comment A-10: Section 4.5, Page 43, Calibrated Parameters:

- No discussion on HOW the calibration was conducted. The report indicates the calibrated curve numbers are within 5% of the originally computed curve numbers. However, there is not a uniform difference between the computed and calibrated numbers. Explanation is required on how the calibrated

numbers were derived – the process and methodology. Why are some greater, some less than? Most are changed by 0 to +/- 1.6 %, one by +7.5 %, one by -8.04 % and one by -32.5 %. Please explain the methodology used during the calibration process.

- The July 14 Comment A-16 requested a discussion on the methodology used to calibrate. The response "Revised, please refer to the newly organized Sections 3.3 and 4.3" indicates the report was revised to address this comment. As can be seen from bullet above, this is not the case.

Response: See Section 3.1 and Sections 4.1 to 4.3. Further clarification has been added to Section 4.3.

Comment A-11: Previous (July 14) Comment A-21:

- Why is a discussion of the calibration and sensitivity results as well a summary including what these results mean to the application phase not applicable? This is very important to the interpretation and confidence of the application phase results.

Response: This section does not exist any more. It's being modified to the new format, which already discusses the significance in Sections 4 and 5. Further clarification has been added to Sections 4 and 5.

Comment A-12: Previous (July 14) Comment A-24:

- No sensitivity analysis was presented or discussed regarding the Manning's n values although response to comment was "Revised and reorganized".

Response: See Section 4.3. Further clarification has been added to Section 4.3.

Comment A-13: Previous (July 14) Comment A-33:

- Response indicates "Revised and Reorganized" however comment was not addressed in any of the revision or reorganizations.

Response: See the DSS file included in Appendix C-3

Comment A-14: Previous (July 14) Comment A-34:

- A CD of the entire report with each hard copy is applicable and should be provided with the final version of the report.

Response: See Appendix C-3

Comment A-15: Previous (July 14) Comment A-39:

- Figure 5-2 in original draft is, I believe revised Figure 3-3 and comment also applies to revised Figure 4-1. Figure is still not clearly explained in text or on the Figure. Should be clear in both. As discussed during the July 14 meeting, the figure should also plot the bank profile for the entire length of the C-51 canal.

Response: Revised and updated

Comment A-16: Previous (July 14) Comment A-67:

- Response "Revised and Reorganized" to this comment indicates that a sensitivity analysis was conducted and completed. However the results are not presented.

Response: See Section 4.3. Further clarification has been added to Section 4.3.

Comment A-17: Previous (July 14) Comment B-4:

- Explain why this comment was "Not Applicable".

Response: See Section 4.3. Further clarification has been added to Section 4.3.

Comment A-18: Appendices B-5, B-6 and B-7:

- Include units in all tables.

Response: Revised and updated

Part B: External Technical Review Team Comments

The following comments are compiled based on review of the draft deliverable by the external Technical Review Team for the C-51 study.

Comment B-1: Appendix A:

- February 11 Meeting Summary, Item II Secondary Inflow Facilities, Bullet A:
  - Indian **Trail** Improvement District", not Trails.
  - End of paragraph: add "for the post West C-51 Project conditions."
- March 14 Meeting Summary, Bullet 3:
  End of second paragraph: add "This study does not include post storm drawdown analysis."

Response: Revised and updated

Comment B-2: Curve Numbers:

- The results look much better and the CN's are reasonable. Reviewer is pleased to see the curve number calibration is so close to the calculated input.

Response: Thank you.

Comment B-3: Calibration Results Table 4-1 and 4-2:

- Reviewer is concerned that the head loss in the C-51 Canal between WEL and SR-7 is 0.75' measured and 0.48' simulated, see Table 4-1, while the flow at the SR-7 station is 1060 measured and 3296 simulated, see Table 4-2. This leads to the suspicion that the C-51 simulated canal losses are too low. Likewise the measured 7805 cfs, and simulated 9298 cfs flow at S-155 makes me suspect the C-51 canal losses are too low.

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values.

Comment B-4: Calibration Results – acceptability statement:

- Section 4.5 concludes "the accuracy of the calibrated results is acceptable." Please reconsider, reference Table 4-2, a + 211% difference (1060 vs 3296 cfs) at SR-7 is not what I would like to see.

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values. See Revised Section 4.5.

Comment B-5: Calibration Results – See November 15, 1999 letter from Jay Foy to ITID for reference:

- The peak stage in the VRPB was 18.0' for Hurricane Irene. The model results are 18.44'. This is close; however I would prefer the simulation to be lower because it may have impacts to future Flood Insurance Rates in the VRPB.
- The stage at the M-1 Canal in the C-51 Canal in Figure 4-1 appears to be about 16.2'. The November 15, 1999 letter depicts 17.5' at the C-51 side of the Amil gate. There is very little loss through the box culvert under Southern Boulevard, so I would expect that 17.3' to 17.4' was the stage in the C-51 Canal, not 16.2'. Again this leads me to the conclusion that the losses in the C-51 Canal are too low.

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values. See revised Section 4.5.

Comment B-6: Table 4-4:

- The peak discharge from the VRPB, basin 15 A, is 509 cfs. This may be correct due to tailwater, but I would double check this to make sure both the Amil gate and the twin 72" "bleeder" pipes are included. It seems to be low knowing the capacity of a D-710 Amil gate and twin 72" RCP's. The question is: why is there no discharge from 15 B? This is correct because ITID is allowed discharge after the storm. Just asking to make sure no discharge is shown for the right reason.

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values. See revised Section 4.5.

Comment B-7: Typos:

- At the bottom of page 28 and at the top of page 29 and in the middle of page 37 the report says the hurricane Irene. Should read just Hurricane Irene.

Response: Revised and updated

Comment B-8: Page 40, Table 4-3:

- Table 4-3 shows a comparison of measured and simulated stages at a few points along the C-51. Is the simulated stage on Oct 16th correct? It seems out of place with all other values for that location. The measured stage shows a peak on the 16th. The simulated stage does not. This is the only date where the two stages are significantly different. At the C51WEL, location there is a significant difference between the measured and simulated stages for Oct. 14-

16. All others are reasonably close. Do we know why? Can this be tweaked to bring them closer together?

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values. See revised Section 4.5.

Comment B-9: Page 44, Table 4-4:

- Table 4-4 gives sub-basin results. If 14.31" of rainfall was used for all sub-basins (see top of page 29) and the current Sub-basin 100 year elevations shown in Volume IV were based on 13.5", why are the sub-basin peak stages in Table 4-4 lower (quite a bit lower in several cases)? Is it possible that the current stages are that far off? Or is the simulation in need of further refinement?

Response: Revised and updated according to the results presented on August 14, 2003 meeting. The results are within 1% of the measured values. See revised Section 4.5. This is a calibration stage. The results in Task 3 (Model Application) will address these issues while comparing the baseline results.

Comment B-10: Page 46:

- Second Sentence: The word "has" should be "have".

Response: Revised and updated

Comment B-11: Figure 3-3 and 4-1:

- Is it possible to identify a few more roadways along the channel bottom profile (east of SR7) shown in Figure 3-3 and Figure 4-1?

Response: Revised and updated

Comment B-12: Figure 3-3 and 4-1:

- Overall, it is shaping up to be a good report.

Response: Thank you.

Comment B-13: Page 11, Table 2-2:

- Sub-Basin 11 "Structure Description": incorrect sill elevation shown for all gates. The sill elevation at the D Canal Gates 9.0' and the sill elevation for both A & G Gates is 10.0'.

Response: Revised and updated

Comment B-14: Rating Curves:

- Are rating curves for the structures no longer being considered? This section is missing from the latest draft. Does the HMS / RAS storage routing eliminate the generation of rating curves?

Response: Not necessary any more. See Sections 3 and 4 for clarification. User's manuals for HMS and RAS explains how and when rating curves are generated.

Comment B-15: Page 32, Inline Structures Section and Page 34, Table 3-6:

- Both reference non-existent Structure G-124 as an inline (7culvert) structure.

Response: The model report has incorporated the correct information. This report presents only the calibration results for the storm event during Hurricane Irene. The structure G-124 did exist in 1999, and was removed only after the hurricane (sometimes in the Year 2000).

Comment B-16: Page 35, Table 3-7:

- Refers to Basin B11/S11 structure at river station 80973 as a weir-type structure. The two (2) - 12 ft. sluice gates at D Canal should be modeled as gate-type structures.

Response: These structures have been modeled as gate structures. The model has been set up correctly.